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IMPULSE RESPONSE SHAPING FOR ULTRAWIDE BAND SAR IN CIRCULAR FLIGHT PATH

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Abstract

To attain useful resolution for a low frequency SAR (Synthetic Aperture Radar) for image mapping, the radar must be designed with a frequency bandwidth close to or greater than its center frequency. This kind SAR is referred to as the ultrawide band SAR. An ultrawide band SAR is capable of an ultimate resolution being a fraction of the wavelength of its center frequency. However, it is relatively difficult to achieve the ultimate resolution from such an airborne SAR flying in a straight line path because of the difficulty in handling its extremely long aperture. In contrary, the synthetic aperture length for this SAR in a circular flight path has a more reasonable aperture length. Due to its potential application in under ground mapping. It is interesting to study some processing related issues. This paper will address the topic of impulse response analysis and shaping.

Due to the complexity of the mathematics, only approximation form of the impulse response was given in prior literature in acoustic field. There is a lack of understanding of the impulse response waveform as a function of the distance between the target and the center of the mapping circle. This paper characterizes the impulse response by the distribution of the residuals of the slant range distance moduloed by a constant. It also suggests a weighting function in the frequency dimension of the fast time to achieve an ideal Jinc function of the impulse response. Simulation results verified both the weighted and unweighted impulse responses.

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